

AN EMPIRICAL INVESTIGATION OF FACTORS AFFECTING CREDIT MARKET

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Abstract

We investigate through an econometric approach the credit market and the factors that interact with it. The current research is beyond the minor aspects of the behavior and determinants of credit market in Romania and our concerns go to macroeconomic factors, consumption, investments and capital market. Results demonstrate a relationship between complex factors such as monetary policy and the credit market.

Keywords: *credit market, monetary policy, macroeconomic factors, non-governmental credit.*

Introduction

The credit market appeared and developed in Romania after 1989. The appearance and the boost of the private sector of the national economy, as well as the increase in household incomes have determined a serious demand for financing, which was mainly satisfied by the financial-banking sector through non-governmental credit. Although initially limited, its development became significant after 2000, when the economic growth¹, combined with the favorable perspective of accession to the European Union, as well as the constant improvement of the internal macroeconomic environment as a result of a well-planned mix of economic policies represented factors which led to an unprecedented growth in non-governmental credit.

This article focuses on the credit market in Romania, in particular during the period 2000-2010. Econometric methods are used to highlight the evolution of this market in the general macroeconomic context as precisely as possible. The main innovation is represented by the estimation and validation of a disequilibrium model for the Romanian credit market for the first time.

The article has the following structure: in the first part this market is described briefly. The main characteristics of the evolution of the credit market are presented, with special focus on its development after 2000, unanimously considered to be the year when the stable and sustainable growth of the national economy began. The second part is an overview of the theoretical framework of the disequilibrium models and of the significant results from the specialty literature related to evaluating/ controlling the credit markets from various countries that apply this set of models. The third part focuses on the evaluation/ control of the credit market by using a disequilibrium model adapted to macroeconomic developments in Romania. The last part of the article includes comments on the estimated model, as well as the conclusions of this analysis.

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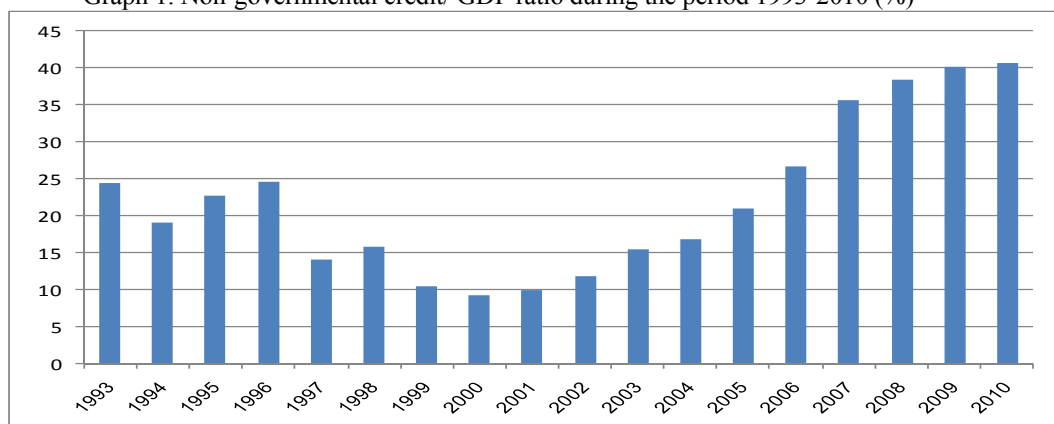
¹ During the period preceding the economic crisis – 2002-2008, the gross national product increased at an average annual rate of 6% (real values).

1. The crediting activity in Romania: main characteristics

In the first decade after 1989, the level of credits was initially very low, which is common to all emerging national economies in Eastern Europe. Starting from 1998, in a relatively short period, several banks went bankrupt and others were privatized, thus facilitating the appearance of foreign capital, which had a positive impact on the development of the credit market. Annex 1 presents a chronological overview of the restructuring of the banking sector, structured according to the information provided in the paper [Isărescu, 2009].

It is well known that bank privatizations improve performance and encourage competition [Clarke, Cull, Shirley, 2005]. As a result of the repositioning of the financial-banking sector, bank credit developed quickly, and its relevant indicators gradually reached the same levels as those in developed countries. The graph below illustrates the evolution in our country of non-governmental credit/ GDP, the most used index according to the specialty literature.

Graph 1. Non-governmental credit/ GDP ratio during the period 1993-2010 (%)



Source: *National Bank of Romania*

In the first stage, 1993-2000, the analyzed indicator had a fluctuating evolution. Thus, after having reached the value of 25% in 1996, it decreased to 14% in 1997 and 9.3% in 2000, as a consequence of the bankruptcies mentioned previously and of the rise in interest rates. During 2001-2010, the non-governmental/GDP ratio increased steadily as a result of the rapid growth in GDP (which led, among others, to increased revenues of the economic operators) and of the decrease of active interest rates. It is important to mention that, apart from these two factors, other causes contributing to this ascending trend were:

- the improvement of prudential bank supervision by the central bank by introducing the uniform banking rating system – CAAMPL – in 1999;
- the use of a new method for calculating the specific provisions for credit risk² starting from 2003.

The indicator registered the highest growth in 2007, when its value was 11 percentage points higher than in the previous year, reaching the level of 35.6%. This spectacular evolution occurred as a consequence of the significant appreciation of the national currency exchange rate, which led to massive capital infusions, a phenomenon that started in the first months of 2006. In its turn, this appreciation was significantly encouraged by external factors:

- the improvement of the investors' perception of the national economy, in a political context;

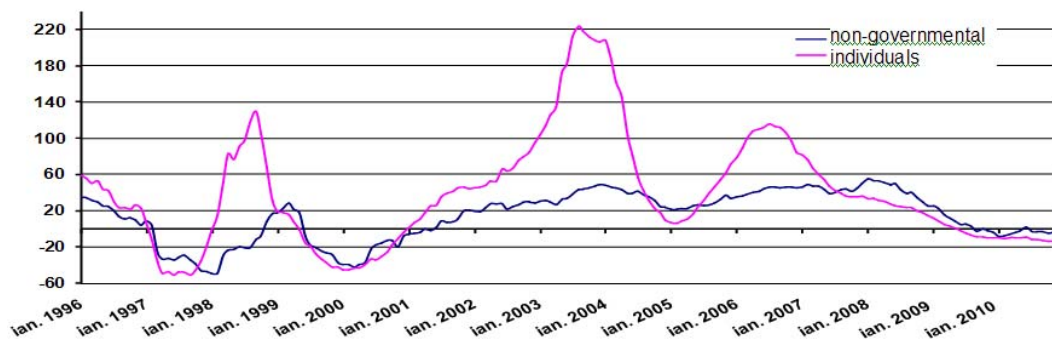
² NRB Regulation 5/ 2002 concerning the classification of credits and investments, as well as the formation, regulation and use of specific credit risk provisions, published in the Official Journal of Romania n. 626/ 2002

- the lei-foreign currencies differential;
- the increased degree of financial integration³.

Due to the economic crisis that has affected our country since the last three months of 2008, the indicator remained stable in 2009 and 2010. We must mention that despite this generally ascending evolution, the final value of the indicator in December 2010 (40.7%) was lower compared to its similar values in developed countries.

The non-governmental credit growth rates also registered high values, which is also true in the case of real increases in consumer credit. One of the causes of this boost is the fact that the initial values were very low. Thus, total non-governmental credit represented the equivalent of only 3.1 billion euro in December 2000, while in December 2010 its value reached 48.8 billion euro, which is a growth of over 1500%. In its turn, consumption credit in the national currency evolved significantly in the same period, from the equivalent of 141.2 million euro to 8.4 billion euro, which represents a growth of over 5900%⁴.

Graph 2. Credit dynamics during the period 1996-2010
(in real terms, the corresponding month in the previous year = 100)



Source: *National Bank of Romania, own calculation*

After having a fluctuating evolution, sometimes reaching negative values in the period 1996-2000, the real growth of consumer credits in lei registered positive values after January 2001, reaching the highest value in the second half of 2003. The dynamics of the indicator had impressive monthly values of up to 223%, a figure that was recorded in August 2003. After a drop in the growth rate at the end of 2004, a new peak was reached in May-September 2006, with values between 110-120%. The phenomenon of credit growth can be to a great extent associated with the significant increase in revenues. This led to a higher demand for goods, especially durable, non-food goods, which finally determined the increase in household credits, both in terms of absolute and relative values.

Generally speaking, non-governmental credit had a similar evolution, with positive values after July 2001 and the maximum value reached in the second half of the analyzed period, in January 2008 (55.5%). Both indicators started to decrease in September 2009. A notable exception was registered in June 2010, when non-governmental credit grew by a marginal value of 1.97%. After this period the real crediting dynamics had only negative values, and the improvement of crediting has not yet been confirmed. There are several factors that have influenced both the supply of credits offered by banks:

³ Isărescu, 2009, p. 250-251

⁴ References were made based on the exchange rates at the end of the respective months

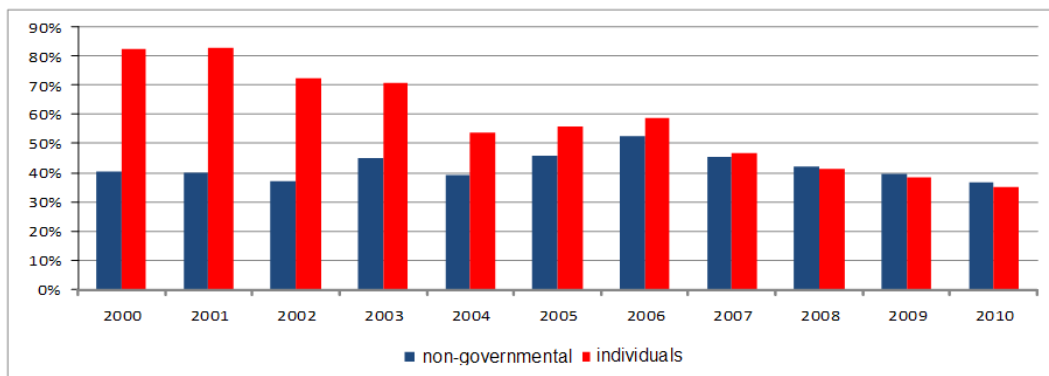
- the increase of the share of state securities portfolio (the appearance of the crowding-out phenomenon);
- the perception of the amplification of risk credit;
- the refusal to loosen credit standards, and the demand for credits;
- the increasingly difficult financial situation of firms and individual consumers (due to government measures for reducing the budget deficit⁵), and that have contributed directly to these negative trends.

Compared to the rhythms of 2007-2008, when the average annual rates had an approximate value of 45%, in 2009 non-governmental credit had an average growth of only 7.5%. Actually, 2009 was the last year when growth was registered, as in 2010 non-governmental credit started to decrease by approximately 3.8%.

As a partial conclusion, we could say that the expansion of the non-governmental credit practically reflected a process of catching-up in the field of financial intermediation, a process which was influenced in a negative way by the difficulties that the Romanian banking system had to face during the period 1998-2002, as well as by the economic crisis that started in the second half of 2009.

Regarding the structure of non-governmental credit in terms of currency denomination, illustrated in Graph 3, the national currency had a higher share in household credit in 2004, when 70-80% of household credits were provided in lei.

Graph 3. The share of credits in lei in non-governmental and consumer credit



Source: *National Bank of Romania, own calculation*

The factors that caused this situation were the central bank's policy of controlled floating of the exchange rate in order to minimize currency risk and the fact that bank resources were mainly denominated in lei during this period (2000-2004).

On the other hand, the share of loans in lei from the total value of non-governmental credit was much lower in the first years of this period, due to the fact that firms generally preferred credits in foreign currencies to finance their import activities and to reduce currency risk, in the context of a relatively high volatility of the exchange rate.

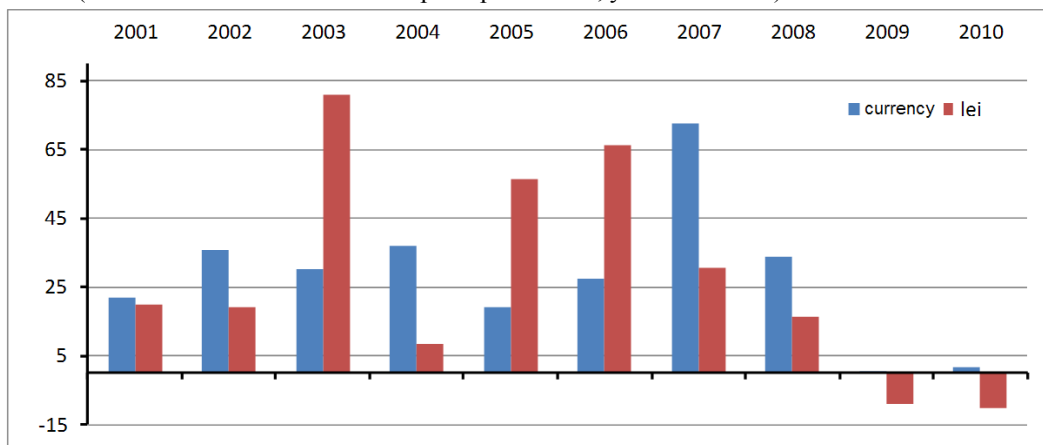
After the liberalization of the capital account, which started in 2004 (one of the conditions for accession in the European Union), individual consumers started to show increasing preference for credits in foreign currencies, the share of loans in lei decreasing below 35% at the end of 2010.

⁵ The increase in the VAT rate from 19% to 24%, through the Emergency Government Ordinance 58/ 2010 (Official Journal of Romania n. 431/ 2010), as well as the decrease in salaries in the state sector by 25%, through Law 118/ 2010 on necessary measures for ensuring a balanced budget (Official Journal of Romania n. 441/ 2010)

During the period 2006-2010, loans in foreign currencies constantly consolidated their share both in non-governmental and in consumer credit, reaching values of 63%, respectively 65%. It is important to notice that 2006, when the share of credits in lei in the non-governmental credit went beyond the psychological threshold of 50%, was also the year when the lowest rate of inflation for the entire period was registered (4.87% December 2006/ December 2005). This year was also the only one when the central bank reached its inflation target ($4\% \pm 1pp$).

The following graph indicates the evolution of non-governmental credit according to the currency denomination of the loans.

Graph 4. Annual credit growth, according to the currency
(values deflated with the consumption price index, year 2000= 100)



Source: *National Bank of Romania, own calculation*

Before 2004, the constant economic growth, as well as the obvious perspectives of accession to the European Union, which were the result of the beginning and finalization of negotiations for accession⁶ in a relatively short period, led to accelerated rates of credit growth. The real growth rates of credits, both in lei and in foreign currencies, were also influenced by the regulations and the monetary policy of the central bank. After the central bank stopped applying its policy for maintaining a low volatility of the exchange rate, the risk related to credits in lei increased and the debtors started to prefer loans in foreign currencies.

In September 2005, the central bank introduced several regulations in order to set limits to credits denominated in foreign currencies⁷, which had a positive influence on the evolution of credits in lei, which registered high growth rates in real terms: 56.5 % in 2005, respectively 66.1 % in 2006. Nevertheless, credit in foreign currencies increased significantly in 2007 by 72.6% due to the inflow of foreign currencies during that year. At the same time, the growth rate of credits in lei dropped to only 30.6% in the same year. Finally, in 2009 and 2010 there was a dramatic slowing down in the growth rates, and in the case of credits in lei there was even a drop in real terms: -9%, respectively -10.1%. This phenomenon can be attributed to the economic crisis, which led to the decrease of GDP after many years of sustained economic growth. The demand for credits decreased drastically as a direct consequence of the significant decrease of the gross domestic product, and credits in lei

⁶ In December 2004 Romania closed the negotiations for all the 31 chapters of the Community acquis, which had started in the spring of 2000

⁷ The NBR Regulation 11/ 2005 on restricting the exposure of credits in foreign currencies, published in the Official Journal of Romania n. 840/ 2005

declined as a result of the decrease in available revenues (denominated to a large extent in lei) of the companies and the individual consumers.

In conclusion, we could say that, on the whole, one of the sources of credit growth was the external financing obtained by commercial banks. The interest rate differential between lei and foreign currencies, as well as the real appreciation of the national currency determined the banks to expand their portfolio of credits in lei. Regarding the credit in foreign currencies, its ascending trend occurred due to the banks' ability to increase their resources through the mechanism of external financing, as well as to the increasingly fierce competition in the banking sector, the credit in foreign currencies being perceived as an alternative to loans in lei.

2. Theoretical framework of the model

A disequilibrium model involves the estimation of two functions, one related to the demand for credits, the other to credit supply. The two sets of independent invariables have to be distinct and to include variables that determine supply and demand from an economic perspective. It is considered that the minimal of the two values represents the level of credit equilibrium on the market. The theoretical framework of this group of models was presented for the first time in the article of Maddala and Forrest [6]. In order to formalize the described method, the following linear regression equations are given:

$$D_t = X_{1t}' \beta_1 + u_{1t}$$

$$S_t = X_{2t}' \beta_2 + u_{2t}$$

where D_t , S_t represent the demand, respectively the supply in period t , the vectors X_1 , X_2 represent the exogenous variables that influence the demand, respectively the supply of credits, and u_1 , u_2 represent the residuals. Then, the level of equilibrium of the market at a given t moment is established by:

$$Q_t = \min(D_t, S_t)$$

This assumption is reasonable, as if demand is higher than the supply, then the excess demand remains unsatisfied, and in the opposing situation when supply is higher than the demand, the excess supply remains uncovered. It is necessary to determine the degree of probability π_t to establish whether each observation belongs to the equation of the demand or to the one of the supply; the method of maximum likelihood estimation is used.

3. Previous results

The method described above has been used relatively recently by various authors for analyzing certain national markets: Ghosh and Ghosh[4] for Korea, Indonesia and Thailand, Barajas and Steiner[2] for Columbia, Peru and Mexico, Nenovsky, Peev and Yalamov[7] for Bulgaria, Baek[1] for Korea, Vodova[8] for the Czech Republic. We will present briefly the results of these studies.

Ghosh and Ghosh[4] use a disequilibrium model to investigate a potential credit crisis in three Asian countries: Indonesia, Korea and Thailand during the period 1997-1998. Credit crisis is a situation when interest rates do not lead to a balance between the demand and the supply of credits, and the aggregate volume of credits is restricted by the demand, meaning there is a rationalization of quantity.

The analysis starts from the premise that a decrease of credit in real terms is consistent with the decrease of the supply or of the demand for credits, or even with declines in both. The key identification issue consists in associating the noticed changes in the actual credit values to the subjacent evolutions of the functions of supply and demand. This issue is solved in an alternative regression framework by setting exclusion restrictions *a priori* (for instance, the restriction that only

the supply of credits, not the demand, is influenced by the banks' ability to provide loans). Thus, the authors assume that the real supply of credits depends on the following variables: i) the real interest rate compared to the cost of resources (the latter is estimated according to the rates for deposits); ii) the current output as a measure of the companies' reimbursing capacity; iii) the commercial banks' real capacity to grant loans. In its turn, the real demand for credits is determined by the following variables: i) the real interest rate; ii) the current output, in order to evaluate both the demand for working capital and as an indicator of future output (calculated as an average in the periods t-2, t-1 and t in order to reduce endogeneity-related issues); iii) the production gap, measured as a deviation of the current industrial production from its long-term trend; iv) stock market prices (as a proxy for expected output); v) inflation, as a general indicator of the macroeconomic environment.

Barajas and Steiner [2] examine the slowing down of bank credits to the non-governmental sector in eight countries in Latin America. By using an econometric approach based on a disequilibrium model, they focus on investigating the possible causes of the decline in three countries: Columbia, Mexico and Peru. Although both the factors that influence the supply and those that influence the demand play a key role, their relative significance varies from one country to another. The econometric analysis uses data at a macroeconomic level to establish if credit contraction situations actually represent a credit crisis. This is defined as a situation in which, for a given level of deposits, banks refuse to increase the interest rate for their loans up to a level where the market becomes saturated.

The functions of aggregate supply and demand for credits in the three countries – Columbia, Mexico, Peru – are estimated. For identifying a model it is necessary to exclude one or several variables included in one function from the other. For this purpose, the authors use the key-variable “capacity to grant loans”, defined as the availability of funds necessary for granting credits. The second challenge involves the identification of variables which provide a reflection of the **macroeconomic context and the business environment**, which the demand for credits should be connected to in a positive way, and the supply should “respond” to the extent to which this affects the level of credit risk. The following variables are included: i) the industrial production; ii) the gross domestic product; iii) the GDP gap – only for Columbia – calculated as a monthly linear interpolation of a three-month gap; iv) the expected inflation rate – the arithmetic average of inflation on a three-month period, expressed in annual terms, focusing on the current month; v) the stock market index. In addition to elements presented in previous studies, two **specific variables** are included for the supply function: the percentage of non-performing loans from the total volume of credits, as well as the percentage of specific credit risk provisions from the total volume of non-performing loans. The dependent variable is the natural logarithm of real credits to the private sector.

The econometric estimates for Columbia, Mexico and Peru lead to the following conclusions:

- macroeconomic conditions influence the demand and sometimes the credit supply;
- the capacity to grant loans plays a key-role in determining the credit supply;
- certain alternative interest rates have a significant impact on the demand for credits.

The study of Nenovsky et. al[7] can be placed in the category of those that use a disequilibrium model, making use of a variety of factors to explain credit supply, respectively credit demand. The authors extend this perspective, whose main limitation consists in the use of traditional “mechanical” factors in establishing supply and demand (the capacity to grant loans, interest rates, income). They consider that this type of approach cannot express the entire range of relations between banks and companies, especially in the context of an economy in transition, which is characterized by significant institutional changes. The argument at the basis of the authors' approach is the following one: credit supply and demand concentrates in themselves to a great extent the entire “range” of relations between companies and banks; in their turn, these relations are a reflection of the economic environment and context. The influencing factors can be grouped in the following categories: i) traditional factors (the size of the companies, the profit, bank resources), which also

include internal regulations, as well as the structure of the banks and the companies; ii) the legal and institutional framework, mainly the restrictions resulting from the implementation of the monetary council regime; iii) corruption, influence exercised by the state; iv) property structure, control over the companies and the banks. Data regarding companies was gathered from a data base which includes 118 large companies listed on the stock market in Bulgaria, and the covered period is between 1998 and 2001. Data about banks was obtained mainly through a questionnaire that all the 35 commercial banks in America completed, and other necessary information was gathered from the banks' balance sheets and profit and loss accounts.

Baek's study[1] uses a disequilibrium model to identify credit crisis in Korea, defined as a situation when credit supply in real terms decreases and there is an excess demand for real credit on the market. The study makes use of monthly data collected in the period 1992-2005.

The author uses the following vectors of independent variables for the Korean credit market:

- for the supply: loans granted in the previous period, the interest differential between the interest rate for credits and the coupons of corporate bonds, bank deposits from the previous period, compulsory reserve rate and the industrial production index;
- for the demand: the value of credits in the previous period, the interest differential between the interest rate for credits and the performance of certificates of deposit and the industrial production index.

Four credit crises are identified (the decline of real credit supply and excess demand for real credit for at least two months). Two of them occurred before the financial crisis, and the most recent one started in December 2004 and lasted 4 months. In the author's opinion, the main causes of these crises are related to the companies' credit risk, the lack of trust persisting on the market and/ or the decrease in the volume of bank deposits. The most effective policy would be to eliminate distrust and to diminish the companies' credit risk rather than to stimulate the expansion of crediting provided by commercial banks. The elimination of factors that determine the decrease of bank deposits would also offer significant support in this direction.

Vodova's article[8] focuses on the credit market in the Czech Republic and uses a disequilibrium model to estimate the volume of loans granted. Thus, the regressive factors used for credit demand are: i) the interest rate; ii) the gross domestic product, with a lag of 3 three-month periods; and iii) the inflation rate, measured by using the consumption price index. For credit supply two independent variables are used: i) the banks' capacity to grant loans, defined as the total liabilities from which minimal reserves, necessary liquidity, cash in the cashier's desks and owners' equity are eliminated; and ii) the gross domestic product, as a measure of the debtors' ability to pay their debts.

The available data cover three-month periods between 1994 and 2006. All the estimated coefficients are statistically significant at the threshold of 5%, and their values are in accordance with the macroeconomic context. The following is worth noticing: positive signs would be expected for both determinants in the equation of credit supply. However, in reality the GDP coefficient has a negative sign, which illustrates the existence of an inverse relation between this parameter and the credit supply. According to the author, this can be explained by referring to the banks' potential anti-cyclic behavior: if they expect a decline in the economic growth in the future, they can reduce their current credit supply. Next, the forecast data is compared to the real one and periods of excess demand – the first and last third in the period (1994-1998, 2002-2006), respectively excess supply (1999-2002), are identified.

The study synthesizes in a table the determinants of both credit demand and supply used in other analyses. The author makes two observations:

- a) some determinants are common, which means that they can be used to control both "sides" of the credit market;

b) the list for credit supply is much longer; as a consequence it is more difficult to control supply than demand. This means that, from the practical perspective of implementing the mix of economic policies, it is easier to influence demand.

4. The empirical disequilibrium model for the credit market in Romania

In the sequel, we shortly describe the variables included within the empirical model, together with their motivation for such a choice. The estimation results are also presented, and some comments on their relevance from an economic viewpoint are made. Finally, we drawn some practical considerations on the credit market evolution and we indicate some future research directions related to the empirical disequilibrium model.

4.1 Description of the model

In order to estimate and subsequently validate the disequilibrium model in Romania's case, first we have to establish the regressors' vectors. The regressors must be macroeconomic indicators that could influence either credit demand or credit supply.

To this end, for credit demand we take into consideration the following vector:

$$X_1 = (\text{IPI}, \text{INFL}, \text{RDCR})$$

where:

- IPI is the manufacturing output index, as a *proxy* for the general economic activity;
- INFL is the inflation rate, measured by consumer price index. This is a truthful indicator of the „quality” of economic environment;
- RDCR is the real lending rate, as a price of the credits granted by banks;

In demand's case, the manufacturing out index will be lagged, and the lag's value will be chosen to offer the best statistical parameters. Economically speaking, a certain lag means that a better creditworthiness, resulted from getting revenues in a past period, allows getting credits in present period. Estimation of the demand's regression should deliver negative coefficients both for lending rate and for inflation rate. The motivation lies in the fact that a worsening of the economic environment (perceived through an inflation rise) as well as an increase in the cost of loans (measured through interest rate) should eventually result in a plummeting demand. The IPI's estimated coefficient should be positive, and this is explained by the fact that growing industrial production increases the creditworthiness of firms and individuals, consequently stimulating the borrowers' demand for new loans.

The regressors' vector for credit demand is as follows:

$$X_2 = (\text{IPI}, \text{CAIM})$$

where:

- IPI - is the manufacturing output index, seen as a measure of borrowers's capacity to repay their debts;
- CAIM – is the real lending capacity of banks, in million lei. The time series was computed as follows: total bank total liabilities (both in lei and foreign currency) minus capital minus cash in vault. Required reserves were calculated by applying the National Bank of Romania rates to the lei and foreign currency liabilities.

Estimating supply regression should lead to a positive coefficient for manufacturing output, due to the fact that its increase determines an improvement of the borrowers capacity to reimburse their debts, especially for companies. In this way, banks are tempted to increase credit supply toward the potential borrowers. In addition, the estimated lending capacity coefficient should be positive and less than 1, since, by definition, it measures banks „power” of granting loans.

The dependent variable is the real non-government credit, CNG, expressed in million lei.

We mention that, since the initial time series are non-stationary, we used the first level series in our model. For D(CNG) series the augmented Dickey–Fuller tests rejects the null hypothesis

of a unit root at significance level of 5%. The completed results of these tests are presented in annex 2.

In order to capture the influence of the economic crisis as an exogen influence factor on the credit market we introduced a *dummy* variable for both regressions, having value 1 for 2009m1-2010m12 interval and 0 otherwise. The rationale behind this as follows: the first quarter of 2009 marked the beginning of the economic crisis from a macroeconomic standpoint, the gross domestic product registering a fall of 6.1% in annual terms.

The nominal values of the lending rates, lending capacity and non-government credit were deflated by the cumulated consumer price index, starting from 31 December 1999.

The time series have a monthly frequency and covers January 2000-December 2010 period (132 observations). The data is obtained from National Bank of Romania website, except for manufacturing production index, which is obtained from Unite Nations Economic Commission for Europe. This index represents the monthly level of manufacturing output, with 2005 as base year, and is de-seasonalised.

The majority of the studies in this research area used the gross domestic product as its research area used the gross domestic product as a *proxy* for the general level of economic activity. Nevertheless we chose manufacturing production index based on the following reasons:

- monthly frequency of the data, which is available for all the other time series, except for GDP;
- in the analysed period, on average, loans to companies account for 70% of the overall non-government credit. This is a strong argument in favour of our choice, since the manufacturing output could heavily influence both credit demand and credit supply.

4.2 Estimations' findings

In order to estimate regression equations we used the software package *Eviews 5.0*. After trying to estimate different variants, we chose *lag 4* for the manufacturing output index, as regressor in demand's equation, since it delivers the best statistical results.

Estimation's results are presented in the following table. Full data are presented in annex 2.

Table 1. Estimation's results

Demand regression (n = 128, k = 4) ⁸		Supply regression (n = 131, k = 3)	
IPI(-4)	21.38 (p=0.005)	IPI	30.72 (p=0.00)
INFL	-18.25 (p=0.013)	D(CAIM)	0.29 (p=0.00)
RDCR	-33.70 (p=0.079)	<i>dummy</i>	-933.37 (p=0.00)
<i>Dummy</i>	-1097.47 (p=0.000)	Constant	-2959.46 (p=0.00)
Constant	-1157.58 (p=0.233)		

Source: *own calculation*

The constant is statistically insignificant in demand's equation, while of all the other coefficients are statistically significant, and the coefficient's signs confirm the expectations.

We observe that for demand's equation both inflation and lending rate negatively affects the demand; the lending rate has a much more influence than inflation, its coefficient is almost twice the inflation's coefficient. We infer that financing costs are greatly taken into account in the process of making borrowing decision by the economic operators, while the general economic climate, represented by inflation rate is considered to a lesser extent. Also the credit demand is positively influenced by manufacturing output index, with lag 4.

⁸ Sample size and number of regressors, respectively

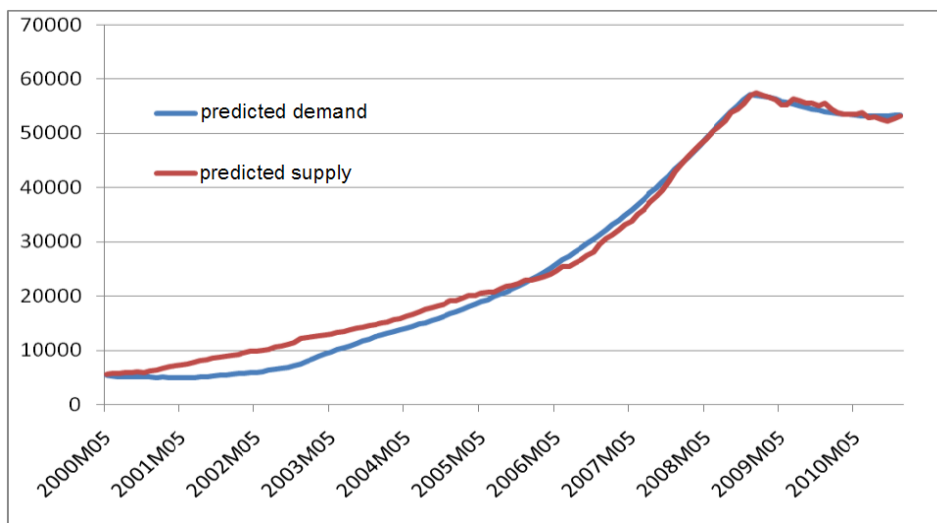
Estimation of the supply regression confirms the heavy influence of the industrial production on the credit supply, at a ratio of 1:30.7. The coefficient of D(CAIM) variable is less than 1 and thus confirms the assumption of using the lending capacity as a barometer for credit supply.

The negative values of the *dummy* variable represent the negative impact of the economic crisis on the credit market. The lesser value of the dummy's coefficient in demand's case shows the greater crisis impact on demand as compared to the supply.

Re-estimating our model by using quarterly data⁹ for the same study period (44 observations) leads to similar results. The complete results are shown in annex 3. A remarkable difference from monthly data is a better explanatory power of the model, the R-squared coefficients being 0.63 and 0.67 respectively. This fact stems from the following argument: a reduced sample rate has the advantage of a better measuring of the exogenous variables on the credit market. It is worth mentioning that, in demand's equation we chose a lag 1 (*id est* three months) in order to get the desired similarity with precedent estimations, where the lag is 4 months.

Having in mind that our estimation delivers the fitted values in **first difference** of the non-government credit, we computed dynamically the theoretical values of the credit demand and supply. We used the initial (observed) values from April 2000 for demand, and from January 2000 for supply as starting points. In general, in the disequilibrium models framework, the actual values of the supply and demand cannot be observed; therefore this „reconstruction” indicates the (theoretical) periods of excess demand or excess supply. The following graph represents the two series.

Graph 5. Excess demand and excess supply, according to the predicted values of D(CNG)



Source: own calculation

After a short period of equilibrium, ended in December 2000, the model predicts the excess supply appeared, starting from January 2001. The „cleaning” of the banking system from the „bad” banks, a process that ended in the first years of the 2000-2010 lead to an excess supply, which persisted until the first half of 2005. Afterwards, the trend reversed, and the excess demand appeared and lasted until the beginning of 2008.

⁹ Quarterly values calculated as average of the monthly data in the current quarter

This could be interpreted either by a reduction of bank supply, or by the emergence of a greater demand, generated by the accession to the European Union and the perspectives of a sustainable growth, which had to be financed. First possible explanation cannot be corroborated, since in this sub-period (July 2005-January 2008) the actual lending capacity increased with a percent of 130%. Moreover, the excess demand was generated by an acute need for new loans, additionally sustained by a sensible reduction of lending rate, from 19.5% in July 2005 to 13.1% in January 2008.

The end of 2008, which marked the beginning of economic recession, coincided with a decreasing trend of both credit market components. In the last two years of the studied period, the excess supply prevailed until August 2010. The last five months of this year registered a resurrection of the credit demand, one possible explanation could be the governmental austerity measures implemented in July 2010. Excess demand appeared on a plummeting credit market, while the firms' and individuals' revenues largely decreased, leading to an emerging need for bank loans as substitute for the previous inherent cuts of profits and salaries.

4.3 Further research area related to the model

This paper's model uses lending capacity as a variable that discriminates between demand and supply, and it is calculated as described in paragraph 4.1. If we take into account the large number of possible factors that may affect credit supply, mentioned by Vodova [7], a future research area is the testing and validation and calibration of disequilibrium models that include those factors, and/or credit supply. Another argument in favour of inclusion of other exogenous variables in the model is the relatively low explanatory power, the R-squared coefficients being in both cases lesser than 0.5.

Additionally, the present study may be improved by estimating coefficients through maximum likelihood method, as presented in Maddala and Nelson [5]. Due to the complexity and the necessity to validate such computations, this research is reserved for a future work.

Conclusions

This paper investigates the Romanian credit market that appeared in the process of transition to the market economy, which include a healthy banking system. First part of our paper is purely descriptive and deals with the synthetically indicators regarding the credit market, closely related to macroeconomic climate.

The second and third parts shortly present the theoretical model, as well as some findings in the economic literature that use of such an approach. The variables used in these studies are reviewed, and the overall conclusions are highlighted.

The last part is dedicated fully to the proposed disequilibrium in Romania's case. The time series, as well as the rationale behind their choice are thoroughly treated, our model being an empirical one. The estimations results on one hand confirm this choice, and on the other hand reveal, by means of the econometric approach, the ongoing processes of the credit market. Re-estimating the model using quarterly data leads to a better explanatory power.

Finally, some possible future research areas related to the improvement of the analysed disequilibrium model are suggested.

References

- Baek, E.G. "A disequilibrium model of the Korean credit crunch", *The Journal of the Korean Economy*, vol. 6, no. 2 (fall 2005), 313-336
- Barajas, A., Steiner. R. , "Why don't they lend? Credit stagnation in Latin America", *IMF Staff papers* vol. 49, special issue, 2002

- Focarelli, D., Rossi, P. “La domanda di finanziamenti bancari in Italia e nelle diverse aree del Paese (1984-1996)”, Temi di discussione, Banca d’Italia, numero 333, Maggio 1998
- Ghosh, S.H., Ghosh, R.A., “East Asia in the aftermath: was there a credit crunch?”, IMF Working Paper No. 38, March 1999
- Maddala, G.S., Forrest, N.D., “Maximum likelihood methods for models of markets in disequilibrium”, *Econometrica*, Vol. 42. No. 6 (November 1974)
- Nenovsky, N., Peev, Yalamov, E.T. “Bank-firms nexus under the currency board: empirical evidence from Bulgaria”, William Davidson Working paper No. 555, April 2003, University of Michigan Business School
- Vodova, P., “Credit market and prediction of its future development in the Czech Republic”, Munich Personal RePEc Archive No. 11904, 2008
- Clarke, G, Cull, R., Shirley, M. „Bank privatization in developing countries: a summary of lessons and findings”, *Journal of Banking and Finance* 29 (2005) pag. 1905-1930
- Isărescu, M.C. “Contribuții teoretice și practice în domeniul politicilor monetare și bancare”, Editura Academiei Române, București 2009, ISBN 978-973-27-1892-6
- * * *, 2000-2010, National Bank of Romania, www.bnr.ro
- * * *, 2000-2010, National Institute Of Statistics, www.insse.ro
- * * *, 2000-2010, United Nations Economic Commission for Europe, www.unece.org

Banking restructuring in Romania, 1998 - 2002

(worked out from [Isărescu, 2009], pp. 286-290)

No.	Bank name	Type of restructuring	Year
1.	Banca Agricolă S.A.	privatization	1999-2001
2.	Banca Albina S.A.	insolvency	1999
3.	Bankcoop S.A.	insolvency	2000
4.	Bancorex S.A.	acquisition by Banca Comercială Română	1999
5.	Credit Bank S.A.	insolvency	2000
6.	Dacia Felix S.A.	cesionarea creanțelor	2001
7.	Banca Română de Scont S.A.	Insolvency	2002
8.	Banca Turco-Română S.A.	Insolvency	2000-2002
9.	Banca Internațională a Religiilor S.A.	Insolvency	2000-2002
10.	Banca Columna S.A.	Insolvency	2003
11.	Casa de Economii și Consemnațiuni S.A. (CEC Bank din anul 2008)	transformed from savings bank for natural persons to a retail bank	2002
12.	Banca de Export-Import a României S.A.	Transformed from a commercial to state agent for sustaining foreign trade	2000
13.	Banca Română pentru Dezvoltare S.A.	privatization	1999
14.	Bancpost S.A.	privatization	1999-2002

Nota: In 1998 the new laws on banking industry have been adopted as follows: Law no.58/2001-banking law, Law no. 101/1998 on NBR statute, Law no. 83/1998 on insolvency procedure of banks

Estimation Command:

LS D(CNG) IPI(-4) INFL RDCR DUMMY C

Estimation Equation:

$D(CNG) = C(1)*IPI(-4) + C(2)*INFL + C(3)*RDCR + C(4)*DUMMY + C(5)$

Substituted Coefficients:

$D(CNG) = 21.38464513*IPI(-4) - 18.25516384*INFL - 33.70302231*RDCR - 1097.472639*DUMMY - 1157.580223$

Dependent Variable: D(CNG)

Method: Least Squares

Sample (adjusted): 2000M05 2010M12

Included observations: 128 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IPI(-4)	21.38465	7.621782	2.805728	0.0058
INFL	-18.25516	5.533280	-3.299158	0.0013
RDCR	-33.70302	19.04711	-1.769456	0.0793
DUMMY	-1097.473	147.0262	-7.464471	0.0000
C	-1157.580	966.1487	-1.198139	0.2332
R-squared	0.393782	Mean dependent var		371.2944
Adjusted R-squared	0.374068	S.D. dependent var		707.6417
S.E. of regression	559.8570	Akaike info criterion		15.53152
Sum squared resid	38553104	Schwarz criterion		15.64293
Log likelihood	-989.0172	F-statistic		19.97433
Durbin-Watson stat	2.114830	Prob(F-statistic)		0.000000

Estimation Equation:

$D(CNG) = C(1)*IPI + C(2)*D(CAIM) + C(3)*DUMMY + C(4)$

Substituted Coefficients:

$D(CNG) = 30.72715534*IPI + 0.2927893851*D(CAIM) - 933.373874*DUMMY - 2959.46128$

Dependent Variable: D(CNG)

Method: Least Squares

Sample (adjusted): 2000M02 2010M12

Included observations: 131 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IPI	30.72716	5.098769	6.026387	0.0000
D(CAIM)	0.292789	0.044170	6.628736	0.0000
DUMMY	-933.3739	129.3340	-7.216774	0.0000
C	-2959.461	543.2673	-5.447523	0.0000
R-squared	0.538118	Mean dependent var		362.3004
Adjusted R-squared	0.527207	S.D. dependent var		701.9793
S.E. of regression	482.6804	Akaike info criterion		15.22665
Sum squared resid	29588510	Schwarz criterion		15.31444
Log likelihood	-993.3453	F-statistic		49.32064
Durbin-Watson stat	1.912062	Prob(F-statistic)		0.000000

Null Hypothesis: CNG has a unit root

Exogenous: Constant

Lag Length: 3 (Automatic based on SIC, MAXLAG=12)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.389748	0.9064
Test critical values:		
1% level	-3.482035	
5% level	-2.884109	
10% level	-2.578884	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CNG) has a unit root

Exogenous: Constant

Lag Length: 2 (Automatic based on SIC, MAXLAG=12)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.277540	0.0180
Test critical values:		
1% level	-3.482035	
5% level	-2.884109	

10% level	-2.578884
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*MacKinnon (1996) one-sided p-values.

Null Hypothesis: CAIM has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	1.201154	0.9981
Test critical values:		
1% level	-3.480818	
5% level	-2.883579	
10% level	-2.578601	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CAIM) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-10.39558	0.0000
Test critical values:		
1% level	-3.481217	
5% level	-2.883753	
10% level	-2.578694	

*MacKinnon (1996) one-sided p-values.

Annex 3

Dependent Variable: D(CNG)

Method: Least Squares

Date: 02/09/12 Time: 22:30

Sample (adjusted): 2000Q2 2010Q4

Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IPI(-1)	57.77171	26.05692	2.217135	0.0327
INFL	-54.26446	18.05335	-3.005784	0.0047
RDCR	-121.4190	67.64951	-1.794825	0.0806
DUMMY	-3203.095	483.0399	-6.631119	0.0000
C	-2607.625	3354.161	-0.777430	0.4417
R-squared	0.634801	Mean dependent var		1103.063
Adjusted R-squared	0.596360	S.D. dependent var		1674.433
S.E. of regression	1063.813	Akaike info criterion		16.88605
Sum squared resid	43004490	Schwarz criterion		17.09084
Log likelihood	-358.0501	F-statistic		16.51325
Durbin-Watson stat	2.368312	Prob(F-statistic)		0.000000

Dependent Variable: D(CNG)

Method: Least Squares

Sample (adjusted): 2000Q2 2010Q4

Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DUMMY	-2991.448	485.8263	-6.157444	0.0000
D(CAIM)	0.266659	0.103653	2.572629	0.0140
IPI	100.5384	20.15229	4.988929	0.0000
C	-9720.257	2109.659	-4.607501	0.0000
R-squared	0.674130	Mean dependent var		1103.063
Adjusted R-squared	0.649063	S.D. dependent var		1674.433
S.E. of regression	991.9324	Akaike info criterion		16.72560
Sum squared resid	38373265	Schwarz criterion		16.88943
Log likelihood	-355.6003	F-statistic		26.89325
Durbin-Watson stat	1.933698	Prob(F-statistic)		0.000000